

We Claim:

1. A modular computer system for mounting in a multi-tiered support, and configured to use a liquid coolant, comprising:

5 a computer chassis configured for mounting in the multi-tiered support;  
a computer component within the computer chassis;  
a cold plate in thermal communication with the computer component, the cold plate being configured to conduct heat from the component, and further configured to be convectively cooled by the coolant;

10 a heat exchanger configured to dissipate heat from the coolant, wherein the cold plate and the heat exchanger form at least part of a closed-loop cooling system;  
and

a coolant pump configured to pump the coolant through the closed-loop cooling system.

15 2. The modular computer system of claim 1, and further comprising an air mover configured to cool the heat exchanger.

20 3. The modular computer system of claim 2, wherein the air mover is further configured to pump air heated by the heat exchanger out one or more exhaust vents in the chassis.

4. The modular computer system of claim 2, wherein:

25 the air mover is a plurality of fans extending across an intermediate portion of the chassis to define two chambers, the fans being configured to move air from a first chamber of the two chambers to a second chamber of the two chambers; and  
the chassis exhaust vents ventilate the second chamber.

5. The modular computer system of claim 2, and further comprising one or more additional computer components within the computer chassis, wherein the air mover causes airflow that directly cools the one or more additional components.

5 6. The modular computer system of claim 5, wherein the air mover blows directly toward the one or more additional computer components.

7. The modular computer system of claim 5, wherein the air mover draws air through the heat exchanger, and blows air toward the one or more additional  
10 computer components.

8. The modular computer system of claim 2, wherein the air mover configured to blow in a crosswise direction to an exhaust direction.

15 9. The modular computer system of claim 2, and further comprising a component cover configured to cover the cold plate such that it limits disturbance of airflow over the cooled cold plate.

10. The modular computer system of claim 1, wherein the chassis is a 1U  
20 rackmount chassis.

11. The modular computer system of claim 1, and further comprising a control system configured to control the level of cooling provided to the computer component.

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12. The modular computer system of claim 11, wherein the control system controls the operating power of the pump.

13. The modular computer system of claim 1, and further comprising:  
a second computer component within the chassis; and  
a second cold plate in thermal communication with the second computer  
component, the second cold plate being configured to conduct heat from the second  
5 component, and further configured to be convectively cooled by the coolant.

14. The modular computer system of claim 13, and further comprising a control  
system configured to control the level of cooling provided to the first and second  
computer components.

15. The modular computer system of claim 14, wherein the cooling system is  
configured with the first and second computer components in parallel, and wherein  
the control system is configured to control the relative rate of coolant flow to the  
first and second computer components.

16. A modular computer system for mounting in a multi-tiered support,  
comprising:

a computer chassis configured for mounting in the multi-tiered support;  
a computer component within the computer chassis;  
20 a means for convectively removing heat from the computer component using  
a liquid coolant;  
a means for removing heat from the coolant; and  
a means for transferring the heat that was removed from the coolant, out of  
the chassis.

17. A method for cooling a modular computer system including a computer chassis containing a computer component, mounted in a multi-tiered support, comprising:

mounting the computer chassis in a multi-tiered support;

5 convectively removing heat from the computer component using a liquid coolant;

removing heat from the coolant using a heat exchanger; and

transferring the heat removed from the fluid out of the chassis.

10 18. The method of claim 17, wherein the chassis is a 1U rackmount chassis.

19. The method of claim 17, wherein the chassis is a thin rackmount chassis.

20. A modular computer system configured to use a liquid coolant, comprising:  
15 a multi-tiered support;

a computer chassis configured for mounting in the multi-tiered support;

a computer component within the computer chassis;

a cold plate in thermal communication with the computer component, the cold plate being configured to conduct heat from the component, and further  
20 configured to be convectively cooled by the coolant;

a heat exchanger configured to dissipate heat from the coolant, wherein the cold plate and the heat exchanger form at least part of a closed-loop cooling system; and

a coolant pump configured to pump the coolant through the closed-loop  
25 cooling system.

21. A modular computer system for mounting in a multi-tiered support, and configured to use a liquid coolant, comprising:

a computer chassis configured for mounting in the multi-tiered support;

a computer component within the computer chassis;

5 a closed-loop cooling system including a cooling device and a heat exchanger, wherein the cooling device is configured to transfer heat from the computer component to a stream of coolant, and wherein the heat exchanger is configured to dissipate heat from the coolant to air passing through the heat exchanger; and

10 an air mover configured to pass air through the heat exchanger;

wherein the air mover is a plurality of fans extending at least substantially across an intermediate portion of the chassis to define two chambers, the fans being configured to move air from a first chamber of the two chambers to a second chamber of the two chambers; and

15 wherein the chassis forms exhaust vents that ventilate the second chamber.

22. The modular computer system of claim 21, wherein the air mover extends fully across the chassis.

20 23. The modular computer system of claim 21, and further comprising a partition limiting the flow of air from the second chamber to the first chamber.

24. The modular computer system of claim 21, wherein the at least one of the fans of the plurality of fans extending at least substantially across the intermediate  
25 portion of the chassis blows directly into a power supply within the chassis.

25. The modular computer system of claim 21, wherein the air mover draws air through the heat exchanger, and blows air toward the one or more additional computer components.

5 26. The modular computer system of claim 21, wherein the cooling device is a cold plate configured to be convectively cooled by a liquid.

27. A modular computer system for mounting in a multi-tiered support, and configured to use a liquid coolant, comprising:

10       a computer chassis configured for mounting in the multi-tiered support;  
      a plurality of computer components within the computer chassis; and  
      a closed-loop cooling system including a plurality of cooling devices and a heat exchanger, wherein the plurality of cooling devices are configured to transfer heat from the plurality of computer components to a stream of coolant, wherein the  
15       heat exchanger is configured to dissipate heat from the coolant, and wherein the heat exchanger includes a first heat-exchanger portion and a second heat-exchange portion, the first and second heat-exchange portions having coolant passageways separated from one another at both of two different ends by one or more of the plurality of cooling devices.

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28. A modular computer system for mounting in a multi-tiered support, and configured to use a liquid coolant, comprising:

      a computer chassis configured for mounting in the multi-tiered support;  
      a computer component within the computer chassis; and  
25       a cold plate in thermal communication with the computer component, the cold plate being configured to conduct heat from the component, and further configured to be convectively cooled by the coolant.

29. The modular computer system of claim 28, and further comprising a coolant pump configured to pump the coolant through the cold plate.